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United States Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Subject: Davis-Besse Nuclear Power Station Response to NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity"

Ladies and Gentlemen:

On August 21, 2003, the Nuclear Regulatory Commission (NRC) issued Bulletin (BL) 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity." This letter provides the information requested in Bulletin 2003-02 regarding Reactor Pressure Vessel (RPV) lower head penetration inspections at the Davis-Besse Nuclear Power Station, Unit Number 1 (DBNPS). As the NRC staff is aware, DBNPS is currently in an extended outage. Attachment 1 to this letter provides the FirstEnergy Nuclear Operating Company (FENOC) 90-day response requested by BL 2003-02, as well as the 60-day response due following restart.

By letter Serial Number 2973 dated July 30, 2003, FENOC provided the results of inspections of the RPV lower head penetrations performed during the thirteenth refueling outage as of that date. Since July 30, 2003, DBNPS has completed a Normal Operating Pressure test, and has performed additional bare-metal visual inspections following this test. The FENOC response to BL 2003-02 for the DBNPS is included as Attachment 1, and contains the results from these inspections, which showed there were no signs of leakage from the RPV lower head penetrations.

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If you have any questions or require further information, please contact Mr. Kevin L. Ostrowski, Manager-Regulatory affairs, at (419) 321-8450.

The statements contained in this submittal and attachments are true and correct to the best of my knowledge and belief. I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 19, 2003.

By: _____
Lew W. Myers, Chief Operating Officer

MSH/

Attachments: 1. Response to Bulletin 2003-02
2. Commitment List

cc: Regional Administrator, NRC Region III
J. B. Hopkins, DB-1 NRC/NRR Senior Project Manager
C. S. Thomas, DB-1 NRC Senior Resident Inspector
Utility Radiological Safety Board

Response to NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity," for the Davis-Besse Nuclear Power Station, Unit Number 1 (DBNPS)

Bulletin (BL) 2003-02, dated August 21, 2003, required that Pressurized Water Reactor (PWR) licensees that will not enter a refueling outage before December 31, 2003 provide information on the Reactor Pressure Vessel (RPV) lower head penetrations within 90 days of the date of the bulletin, and within 60 days of plant restart following the next inspection of the RPV lower head penetrations. Earlier, by letter dated July 30, 2003 (letter Serial Number 2973), FirstEnergy Nuclear Operating Company (FENOC) provided inspection details from the ongoing Thirteenth Refueling Outage. The DBNPS has since completed a Normal Operating Pressure test, and has performed an additional visual inspection following this test. This test and results are discussed below in response to BL 2003-02.

The Bulletin required that PWR licensees that will not enter a refueling outage before December 31, 2003 provide the following information within 90 days of the date of the bulletin:

(1)(a) A description of the RPV lower head penetration inspection program that has been implemented at your plant. The description should include when the inspections were performed, the extent of the inspections with respect to the areas and penetrations inspected, inspection methods used, the process used to resolve the source of findings of any boric acid deposits, the quality of the documentation of the inspections (e.g., written report, video record, photographs), and the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of the RPV lower head penetrations.

Description of the RPV Lower Head Penetration Inspection Program

During the DBNPS Thirteenth Refueling Outage in Spring 2002, a visual inspection was performed of the Reactor Pressure Vessel (RPV) beneath the flange level. This inspection identified stains consisting of boric acid residue and rust/corrosion running down the external RPV sides and the bottom. A video inspection of the RPV underside was completed in June 2002. This video inspection showed a number of the Incore Monitoring Instrumentation (IMI) nozzles, which constitute the RPV lower head penetrations, having stains around their nozzle penetrations. The majority of nozzles with stains were directly in the flowpaths. The stained deposits around the nozzle penetrations were flat and

tightly adhering to the RPV surface. No indication of 'popcorn-type' boric acid deposits was observed around the nozzle penetrations. No wastage on the RPV underside was found, and no buildup of boric acid or corrosion products was found on top of the RPV underside insulation panels.

In an effort to determine the source of the stained deposits, FENOC staff obtained samples of some of the deposits for chemical analysis. In addition, FENOC sponsored laboratory simulation tests of IMI nozzle reactor coolant leakage to determine IMI nozzle leakage deposit characteristics. This chemical analysis and leakage testing was performed to aid in determining the source of these deposits, their significance, and the capability for early visual detection of IMI nozzle leakage.

As a result of the aforementioned inspections, sampling, chemical analysis, and testing, the FENOC staff concluded these deposits on the RPV underside resulted from boric acid residue and corrosion products washed down from the RPV upper head and from past refueling canal leakage. As demonstrated by IMI nozzle leakage simulation testing (discussed with the NRC at a public meeting on April 4, 2003) and the recent experience at the South Texas Project Electric Generating Station, visible evidence, in terms of built-up boron deposits (as opposed to the as-found tightly adhered stained deposits), would be expected to be present on an IMI nozzle, even for very small leaks.

Following the completion of the inspections and sampling, the RPV underside was cleaned. The Reactor Coolant System, including the RPV, was then temporarily re-pressurized to 250 psig, and all IMI nozzle penetrations were visually inspected for leakage. No indication of leakage was identified from the IMI nozzle penetrations.

In September 2003, the DBNPS increased Reactor Coolant System pressure to a Normal Operating Pressure of approximately 2155 psig for a period of approximately one week. Following this test, the IMI nozzle penetrations were visually inspected with a crawler video camera. This included a 360° bare-metal inspection (VT-2) of each IMI nozzle. The results of this inspection were compared with the results from the baseline inspection performed in May 2003, after the vessel was cleaned. No new boric acid deposits or other indications of leakage were found.

Basis for Concluding that DBNPS Satisfies Applicable Regulatory Requirements Related to the Integrity of the RPV Lower Head Penetrations

The "Applicable Regulatory Requirements" section of BL 2003-02 lists the following regulatory requirements and plant Operating License (Technical Specifications) requirements pertaining to integrity of the RPV lower head penetrations:

- Appendix A to 10 CFR 50, "General Design Criteria for Nuclear Power Plants"
  - Criterion 14 – "Reactor Coolant Pressure Boundary"
  - Criterion 31 – "Fracture Prevention of Reactor Coolant Pressure Boundary"
  - Criterion 32 – "Inspection of Reactor Coolant Pressure Boundary"
- 10 CFR 50.55a, "Codes and Standards," which incorporates by reference Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Boiler and Pressure Vessel Code
- Appendix B of 10 CFR 50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants;" Criteria V, "Instructions, Procedures, and Drawings;" IX, "Control of Special Processes;" and XVI, "Corrective Actions"
- Plant Operating License, Appendix A, Technical Specifications

The following addresses these requirements for the DBNPS:

10 CFR 50, Appendix A –General Design Criteria (GDC)

The GDC included in Appendix A to 10 CFR 50 did not become effective until May 21, 1971. The construction permit for the DBNPS was issued prior to May 21, 1971; consequently, the DBNPS was not subject to the Appendix A GDCs (reference SECY-92-223, 9/18/92). However, the following addresses compliance with the intent of the design criteria for the Reactor Coolant Pressure Boundary.

- Criterion 14 – Reactor Coolant Pressure Boundary

"The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross failure."

Compliance with the intent of GDC 14 is described in the DBNPS Updated Safety Analysis Report (USAR), Appendix 3D.1.10. Through the prevention of degradation of the RPV lower head, there is an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross failure.

As discussed in FENOC's March 31, 2003, letter Serial Number 2833 to the NRC, each Refueling Outage, an "as-found" visual/video inspection of the IMI nozzles will be performed. The inspection will consist of a complete 360° remote bare-metal VT-2 visual examination of each nozzle. The inspection is required to document any evidence of leakage, boric acid residue, the leakage source, discoloration or any evidence of corrosion, and the amount of boric acid found. A representative photo (or video still frame) of each nozzle is retained. The area of identified boron build-up is inspected to determine the extent of condition and the leakage pathway. Components affected by the leak with boric acid deposits or corrosion are examined. Affected areas are inspected to identify any signs of potential corrosion. If indications of leakage or corrosion are observed, a Condition Report is generated for evaluation of the condition. The Operations Shift Manager is notified of any immediate safety concerns. The Plant Engineering Manager is also notified.

A FLUS on-line leak monitoring system is being installed to monitor the RPV bottom head area during plant operation. In addition, as previously stated in FENOC's July 30, 2003 letter Serial Number 2973, a complete 360° remote bare-metal VT-2 visual examination of each IMI nozzle will be performed during the Cycle 14 mid-cycle outage.

By maintaining these or other equivalent programs there is a reasonable assurance of continued compliance with this criterion.

- Criterion 31 – Fracture Prevention of Reactor Coolant Pressure Boundary

"The reactor coolant pressure boundary shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a nonbrittle manner and (2) the probability of rapidly propagating failure is minimized. The design shall reflect consideration of service temperatures and other conditions of the

boundary material under operating, maintenance, testing, and postulated accident conditions and the uncertainties in determining (1) material properties, (2) the effects of irradiation on material properties, (3) residual, steady state and transient stresses, and (4) size of flaws."

Compliance with the intent of GDC 31 is described in the DBNPS USAR Appendix 3D.1.27. The Reactor Pressure Vessel lower head and associated penetrations are constructed of materials that have sufficient margin to behave in a non-brittle manner under operating conditions. The inspection programs described under Criterion 14 above provide a means of detecting degradation of the RPV lower head or IMI nozzles. By maintaining these or other equivalent programs there is a reasonable assurance of continued compliance with this criterion.

- Criterion 32 – Inspection of Reactor Coolant Pressure Boundary

"Components which are part of the reactor coolant pressure boundary shall be designed to permit (1) periodic inspection and testing of important areas and features to assess their structural and leaktight integrity, and (2) an appropriate material surveillance program for the reactor pressure vessel."

Compliance with the intent of GDC 32 is described in the DBNPS USAR Appendix 3D.1.28. The program described under Criterion 14 above addresses periodic inspection and testing of the RPV lower head and the IMI nozzles to assess their structural and leak-tight integrity.

10 CFR 50.55a – Codes and Standards

10 CFR 50.55a, "Codes and Standards," requires that inservice inspection and testing be performed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, "Inservice Inspection of Nuclear Plant Components." Section XI contains the applicable rules for the examination, evaluation, and repair of ASME Code components which includes the reactor coolant pressure boundary.

The DBNPS Third Ten-Year Inservice Inspection (ISI) Interval, which began on September 21, 2000, is implemented in accordance with the 1995 Edition through the 1996 Addenda of ASME Section XI. There are no specific nondestructive examination requirements specified for the RPV lower head IMI nozzle welds. The IMI nozzle welds are examined using Examination Category B-P, "All

Pressure Retaining Components." Examination Category B-P requires a VT-2 visual examination of the reactor vessel pressure retaining boundary each Refueling Outage during the system leakage test conducted at normal operating pressures. This examination is conducted without the removal of insulation as permitted by IWA-5242, "Insulated Components;" see page 4, Criterion 14 for discussion of bare-metal inspections. The VT-2 examination results are compared with the acceptance standards of IWB-3522, which require correction of pressure boundary leakage prior to continued service. By performing these examinations in accordance with ASME Section XI, the DBNPS is in compliance with the requirements of 10 CFR 50.55a.

10 CFR 50, Appendix B – Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants

- Criterion V – Instruction, Procedures, and Drawings

  "Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished."

  Activities associated with the RPV lower head and IMI nozzles (including tests and inspections) are performed in accordance with the FENOC Quality Assurance Program. Procedures that address activities associated with quality-related structures, systems, and components are subject to an established preparation, review, and approval process as defined in the Quality Assurance Program. Appropriate quantitative or qualitative acceptance criteria are required to be included in procedures. The RPV lower head and IMI nozzle inspections are performed in accordance with Reactor Vessel Inspection Procedure EN-DP-01500.

- Criterion IX – Control of Special Processes

  "Measures shall be established to assure that special processes including welding, heat treating, and nondestructive testing are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specification, criteria, and other special requirements."

FENOC has implemented a Quality Assurance Program that conforms to the criteria established in 10 CFR 50 Appendix B, Criterion IX. Repairs and inspections are conducted and qualified as required by Section XI of the ASME Code. Where ASME Section XI is not applicable, personnel and processes are qualified in accordance with the FENOC Quality Assurance Program.

- Criterion XVI – Corrective Action

"Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management."

Activities associated with the RPV lower head and the IMI nozzles (including corrective actions) are performed in accordance with the FENOC Quality Assurance Program. Under this program, personnel are responsible for implementation of the Quality Assurance Program as it pertains to performance of their activities. The FENOC Corrective Action Program requires that conditions adverse to quality be corrected. In the case of significant conditions adverse to quality, procedures require notification of management, determination of the cause, and action to preclude recurrence. Reactor Vessel Inspection Procedure EN-DP-01500 directs initiation of a Condition Report upon discovery of any indications of leakage or corrosion.

Plant Operating License, Appendix A – Technical Specifications

DBNPS Technical Specification Limiting Condition for Operation (LCO) 3.4.6.2 includes a requirement and associated action statements addressing Reactor Coolant System leakage. The limits for Reactor Coolant System leakage are stated in terms of the amount of leakage, for example, less than or equal to one gallon per minute for unidentified leakage; less than or equal to ten gallons per minute for identified leakage; and no Reactor Coolant Pressure Boundary leakage.

Leaks from Alloy 600 RPV lower head penetrations can be below the sensitivity of typical on-line leakage detection systems. This condition has been evaluated by

the industry and the NRC and it has been determined that the appropriate action is to perform bare-metal visual inspections for boric acid deposits during plant shutdowns. If an indication of leakage is found, the defect must be repaired before the plant goes back on line. If Reactor Coolant System leakage during DBNPS operation increases to the point where it exceeds plant administrative limits, then the leak must be evaluated. These administrative limits are a fraction of the Technical Specification leakage limits and support maintaining compliance with the Technical Specifications.

(1)(b) **A description of the RPV lower head penetration inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the extent of the inspections which will be conducted with respect to the areas and penetrations to be inspected, inspection methods to be used, qualification standards for the inspection methods, the process used to resolve the source of findings of boric acid deposits or corrosion, the inspection documentation to be generated, and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of the RPV lower head penetrations.**

DBNPS Procedure EN-DP-01500 Revision 4, "Reactor Vessel Inspection Procedure," addresses inspection of the IMI nozzles. As discussed in item (1)(a), each Refueling Outage, an "as-found" visual/video inspection of the IMI nozzles is performed. Inspection personnel are qualified to the DBNPS Boric Acid Corrosion Control Program. The inspection consists of a complete 360° remote bare-metal VT-2 visual examination of each IMI nozzle. Personnel are required to document any evidence of leakage, boric acid residue, the leakage source, discoloration or any evidence of corrosion, and the amount of boric acid found. A representative photo (or video still frame) of each nozzle is retained. The area of identified boron build-up is inspected to determine the extent of condition and the leakage pathway. Components affected by the leak with boric acid deposits or corrosion are examined. Personnel inspect affected areas to identify any signs of potential corrosion. If indications of leakage or corrosion are observed, a Condition Report is generated for evaluation of the condition. The Operations Shift Manager is notified of any immediate safety concerns. The Plant Engineering Manager is also notified. The Reactor Vessel Inspection Procedure provides for written records retained in accordance with the DBNPS Records Management program. Plant Engineering currently holds the most recent inspection videos. The Reactor Vessel Inspection

Procedure will be revised before the Cycle 14 mid-cycle outage, to specify the retention requirements for RPV inspection videos.

DBNPS Procedure DB-PF-03010 Revision 4, "RCS Leakage Test," addresses under RPV examinations during the normal operating pressure system leakage test. As discussed in item (1)(a), a VT-2 visual examination of the reactor vessel pressure retaining boundary is performed each Refueling Outage during the normal operating pressure system leakage test prior to restart. Personnel are qualified as VT-2 Level II Examiners. The examination is conducted without the removal of insulation, as permitted by IWA-5242, "Insulated Components;" see the previous paragraph for discussion of bare-metal inspections. The VT-2 examination results are compared with the acceptance standards of IWB-3522, which require correction of pressure boundary leakage prior to continued service. Records capture and processing is performed according to the standard requirements of the DBNPS Surveillance and Periodic Test Program.

Section (1)(a) addresses the basis for concluding that the DBNPS will satisfy applicable regulatory requirements related to the structural and leakage integrity of the RPV lower head penetrations.

(1)(c) **If you are unable to perform a bare-metal visual inspection of each penetration during the next refueling outage because of the inability to perform the necessary planning, engineering, procurement of materials, and implementation, are you planning to perform bare-metal visual inspections during subsequent refueling outages? If so, provide a description of the actions that are planned to enable a bare-metal visual inspection of each penetration during subsequent refueling outages. Also, provide a description of any penetration inspections you plan to perform during the next refueling outage. The description should address the applicable items in paragraph (b).**

This item is not applicable to the DBNPS because the DBNPS will perform a bare-metal visual inspection.

(1)(d) **If you do not plan to perform either a bare-metal visual inspection or non-visual (e.g., volumetric or surface) examination of the RPV lower head penetrations at the next or subsequent refueling outages, provide the basis for concluding that the inspections performed will assure applicable regulatory requirements are and will continue to be met.**

This item is not applicable to DBNPS, because the DBNPS will perform a bare-metal visual inspection.

The Bulletin also required:

(2) **Within 60 days of plant restart following the next inspection of the RPV lower head penetrations, the subject PWR addressees should submit to the NRC a summary of the inspections performed, the extent of the inspections, the methods used, a description of the as-found condition of the lower head, any findings of relevant indications of through-wall leakage, and a summary of the disposition of any findings of boric acid deposits and any corrective actions taken as a result of indications found.**

See item (1)(a) for a summary of inspection results obtained during the current outage. The most recent inspection was performed in September 2003. At that time, DBNPS increased Reactor Coolant System pressure to approximately 2155 psig for a period of approximately one week. Following this test, the Incore Monitoring Instrumentation (IMI) nozzle penetrations were visually inspected with a crawler video camera. This included a 360° bare-metal VT-2 visual inspection of each IMI nozzle. The results of this inspection were compared with the results from the baseline inspection performed in May 2003, after the vessel was cleaned. No new boric acid deposits or other indications of leakage were found. Accordingly, no corrective actions were required.

COMMITMENT LIST

The following list identifies those actions committed to by Davis-Besse Nuclear Power Station (DBNPS) in this document. Any other actions discussed in the submittal represent intended or planned actions. They are described only for information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at DBNPS of any questions regarding this document or associated regulatory commitments.

COMMITMENT	DUE DATE
The Reactor Vessel Inspection Procedure will be revised before the next refueling outage, to specify the retention requirements for Reactor Vessel inspection videos.	Before the Cycle 14 Mid-Cycle Outage.
Perform a visual inspection, consisting of a complete 360 degree examination of each IMI nozzle during the Cycle 14 mid-cycle outage. (source: Serial 2973, July 30, 2003)	Cycle 14 Mid-Cycle Outage.